MACHINERY AND THE LABORERS.

SUMMARY.

Effect of new inventions upon laborer's income, 210–226.—*a*. Measured by an absolute standard, 210–211.—*b*. As compared with the income of the capitalist class, 211–226.—Effect on his person, 226–232.—*a*. Increasing demand for conformability, 226–228.—*b*. Reducing amount of routine mechanical work, 228–232.

In his excellent article on The Effects of Labor-saving Devices on Wages, in this Journal for November, 1905, Professor Johnson has not only anticipated many of my own conclusions, but has stated the matter so admirably that it would be superfluous to attempt another discussion of the points which he has covered. There are, however, certain aspects of the general problem which he did not attempt to expound, and these, together with the time which has elapsed since the publication of his article, must furnish whatever excuse is needed for the present paper.

The general conclusion reached by Professor Johnson is that "there is no logical basis for the view that every labor-saving invention must necessarily benefit the laborers in the long run." With this conclusion no one can quarrel after mastering the arguments upon which it is based. One might still maintain, however,—and Professor Johnson admits as much,—that the net result of all labor-saving inventions taken together has been some gain in the conditions of the laboring classes as a whole, and that it will *probably* continue to be so in the future. This gain, however, is a gain only when measured from some absolute standard; that is, the laborers are lifted somewhat higher above an absolute physical minimum

of subsistence than they were before these inventions were introduced or than they would have been if these inventions had never been introduced.

Hardly less important, however, than the question of the absolute improvement of the conditions of the laboring class is the question of its relative improvement as compared with other classes. Do the laborers gain as much as other classes (capitalists, for example) from these improvements in the arts of production? Do the advantages of industrial progress go mainly to the laboring classes or mainly to the capitalist and land-owning classes, or are they shared equally or proportionately? The peace of society depends almost as much upon this question as upon that of the absolute gain or loss to the laboring classes. The discontent of the laboring classes may be expected to increase, in spite of a rising standard of physical comfort, if they see that they are falling farther and farther behind other classes or that other classes are gaining more rapidly than they. This discontent is not likely to be allayed by demonstrating to them that they are several stages farther removed from physical want than their fathers and grandfathers were, so long as they believe that others are gaining more and entering more largely into the benefits of advancing civilization than they themselves are.

Professor Johnson's conclusion carries with it, as a matter of course, the conclusion that there is no necessary reason for believing that the laboring classes gain as much from an invention as other classes do. If the laborers do not necessarily gain anything whatever, obviously they do not necessarily gain as much as some one else, because somebody must gain if the invention is an improvement at all. But one observation made by Professor Johnson, sufficiently accurate when applied to the question which he had in mind, can scarcely be applied to the question

now before us. He remarks, "Since, then, labor-saving devices may vary so widely in their economic characteristics, it appears to be unscientific to group them together when it is our aim to discover their economic effects. Such a method of procedure may prove anything. Rather we should construct theoretical types possessing clearly defined characteristics which represent the various possible economic relations, and study the possible effects of each of these types." All this is true enough if the question in hand is whether each and every labor-saving improvement must necessarily benefit the laboring classes. This question is definitely answered in the negative when one clearly defined type of improvement is found to confer no benefit whatever upon the laboring classes. But, if the question is, Are laborers as a matter of fact gaining or losing as a result of the sum total of all the industrial improvements? it is necessary to consider the improvements as a group. If the question relates merely to the absolute improvement of their condition, the answer is so obviously in the affirmative as to need no discussion. But it is otherwise with the question of their relative improvement. Upon this point there is considerable difference of opinion. Some go so far as to maintain that, in the long run at least, the advantages of improvement go chiefly to the laborers,[1] while others are equally positive in the opinion that practically the whole advantage goes to the capitalist or to the land-owner.[2] Between these extremes there is room for every possible variation of opinion.

It is interesting to notice that even the strongest theoretical arguments in favor of the proposition that in the end the laborer gains from labor-saving inventions are

[1] *Cf.* J. B. Clark, Distribution of Wealth, p. 412; also publications of the American Economic Association, 3d series, vol. iv. pp. 130–142. *Cf.*, also, F. A. Walker, The Wages Question.

[2] For example, Karl Marx and Henry George.

equally strong in favor of the proposition that the capitalist gains still more. Take, for example, the oft-repeated illustration of a "product-multiplying invention." This is an invention which, at first substituting machinery for labor, so cheapens the product that consumers buy more of it, so much more that in the end more laborers are employed in its production than before. There is thus a direct increase in the demand for labor in the industry in question, besides the advantage to the laboring class as a whole through the cheapening of the product. Now machinery is capital, and the substitution of machinery for labor is the substitution of capital for labor. This means that when the labor-saving device is introduced, the ratio between the labor and the capital employed in the industry is changed, capital assuming a relatively larger and labor a relatively smaller rôle. In the manufacturing of a given unit of product, more capital and less labor are used. Otherwise, it is not a labor-saving device.[1] If the total product is so increased as to require more labor in the aggregate than before, the increase in the quantity of capital required will necessarily be still greater.

This is a mere matter of arithmetic. Let us assume that before the introduction of a certain labor-saving invention in a certain industry it required normally, and on the average, 100 laborers and $5,000 worth of capital to manufacture 1000 units of product, and that, after the invention is in use, 50 laborers and $6,000 worth of capital can manufacture the same quantity, namely, 1,000 units. If the consumption should so increase through this cheapening process that 3,000 units would be demanded where 1,000 units had been before, it would now require 150 laborers, or there would be a net gain of 50 per cent.

[1] Some inventions, it is true, are capital-saving rather than labor-saving, but these will be considered later.

in the demand for labor. But, at the same time, to manufacture the increased product would require $18,000 worth of capital as against the $5,000 worth which had been required before,—a net gain of 360 per cent. in the demand for capital. If we assume that conditions in other industries remain unchanged, the net result of this invention will be to increase the demand for capital in the whole community more than proportionately to the increase in the demand for labor and to give the capitalist class the larger share of the advantages of the improvement.

If the product is an article consumed alike by laborers and capitalists, both will gain alike as consumers through this cheapening. If it is consumed mainly by the laboring classes, their gains as consumers will be greater than those of capitalists, and this may help to even up the comparative advantages to the two classes. But if, on the contrary, it is an article consumed mainly by the capitalist classes, their superior gains from the side of production would be accentuated from the side of consumption. If, however, we consider the question of improvement in general, the benefit from the standpoint of consumption through the cheapening of consumers' goods must be assumed to go to one class as often as to the other. Therefore, we may eliminate entirely the question of advantages to consumers.

In order that an invention may be "product-multiplying" rather than "labor-displacing," there must be an elastic demand for the product. In other words, a moderate fall in its price must occasion a considerable increase in the amount consumed. If, on the other hand, the demand is inelastic,—that is, if it takes a considerable fall in price to occasion a small increase in the amount consumed,—there is no reason to suppose that any more labor (or even as much) would be required in the industry

in question after the labor-saving invention was introduced than before. This, of course, would depend upon the degree of inelasticity shown by the demand. But it is pretty certain that more capital will be used, assuming that the invention is a labor-saving rather than a capital-saving device. There is no reason to suppose that any cheapening of the product would actually reduce the amount consumed. And, if even the same number of units of product are required after the improvement as before, more capital would be used in their production, since one effect of introducing the labor-saving device is to require more capital and less labor in the production of each unit. Here, therefore, would be a case where, from the side of production at least, capital would gain and labor lose, not only relatively, but absolutely.

As already suggested, some inventions are capital-saving rather than labor-saving. These may be grouped under two classes: first, labor-saving improvements, introduced into the manufacture of machinery and other forms of capital; second, inventions which enable a cheaper kind of machine to displace a more expensive kind. An invention of the first type, tho labor-saving rather than capital-saving in the industry where it is itself employed, becomes capital-saving rather than labor-saving for the industry in which its product is used. Electric cranes and other labor-saving devices in a rolling mill for the manufacture of steel rails will serve as an illustration. In the rolling mill they are labor-saving devices pure and simple; but steel rails are a part of the capital of the railroad, and, in so far as these improvements make rails cheaper, they save capital to the railroad company. They enable the company to construct its road and maintain it at a given standard of efficiency at a lower cost than would otherwise be possible. Since our quantitative notions of capital are always expressed

in terms of value, when there is less value in the rails, there is less capital in the road, other things being equal. That is to say, capital is saved by cheapening the price of steel rails.

An invention of the second type looks at first glance like a capital-saving device, pure and simple. Logically, however, it does not differ so very much from an invention of the first kind. Inventing a new and cheaper machine to do the work formerly done by an expensive machine has about the same effect, so far as our problem is concerned, as inventing a cheaper way of making the older machine. The reason the new machine is cheaper than the older one is probably because it takes less labor to make it. When this is the case, it resembles in all essential particulars the cheapening of the process of making the older machine. In both cases, labor is saved in the industry which supplies productive goods to another industry, but capital is saved in the latter industry. The general result in either case is a saving in both labor and capital to the community as a whole. Whether the saving of labor is greater than that of capital or *vice versa* is impossible to say off-hand. That question depends upon a great variety of circumstances. Fortunately, it is not necessary to our purpose that this question be answered in any individual case. The most that can be said in advance is that it is extremely unlikely that the margin of difference in favor of the laborer, if there is such a margin at all in these classes of inventions, will be large enough to overbalance the very distinct margin in favor of the capitalists in those classes of inventions which are merely labor-saving and not capital-saving in any sense.

We have still to consider the possible case of an invention which is merely capital-saving and not labor-saving in any sense. This would be an invention which would substitute a cheaper for a dearer form of capital,

and which would effect the cheapening of the new form without any saving of labor in its production. Such a thing appears impossible, and would certainly be very difficult to find in actual fact. But there may be certain cases which look like it. It is possible, for example, that coal might become cheaper, not through any saving in the labor of mining or transporting it, but through the discovery of new sources of supply, thus reducing the monopoly profits which now form a part of the present price. That is to say, the labor cost of producing a ton of coal might be as high as before, but the price might fall, and the reduction in price come out of the profits of monopoly. This cheapening of coal might in turn cheapen the production of certain forms of capital without any reduction in the labor of making them. So far the result is wholly due to a new discovery of natural resources rather than to an invention. But the cheapening of fuel may make practicable a certain type of machine which had formerly been impracticable.

Let us suppose that, in the making of machine A, the labor cost is 50 and the capital cost is 50, of which the fuel cost is one-fifth, or 10, making a total cost of 100: whereas, in the making of machine B, the labor cost is likewise 50, but the capital cost is 60, of which the fuel cost is two-thirds, or 40, making a total cost of 110. A is the cheaper machine, and, assuming that they are equally efficient, A will be used in preference to B. B will not appear in actual use at all, even tho its concept might exist in the mind of an inventor and a model of it might be on exhibition in various places. But a fall of 50 per cent. in the price of fuel would reduce the cost of A to 95 and that of B to 90. B would now be the cheaper machine, and would come into actual use as a substitute for A. Capital would be saved to the factories using these machines, and this saving of capital would not be accomplished by

any saving in labor. This appears, outwardly at least, to be an economy resulting from the substitution of a cheaper for a dearer machine, tho in reality it is directly traceable to the discovery of a new coal field, and therefore should be excluded from consideration.

In fact, if we rule out the influence, direct or indirect, of discoveries of new lands and natural resources, it would be difficult to imagine any mechanical invention which could prove economical without saving labor somewhere. If there are such cases, they must be so rare as to have little influence on the net result of inventions in general. We must expect, therefore, to find that the net result of all inventions is and has been to save labor more than to save capital, or to increase the employment of capital more rapidly than that of labor. This means that, as the result of inventions alone, capital comes to play a larger and larger rôle in industry.

This is capable of being tested statistically, tho, so far as the writer is aware, no such statistical test has yet been applied. In the absence of such a test, we must rely upon general observation. Few observers would deny that more capital is actually used in connection with each unit of labor, say with each laborer, now than before the rise of the present régime of machine industry; nor are many likely to deny that the proportion of capital to labor is still increasing with every advance in mechanical invention. It is doubtful if a single industry can be found in which the amount of capital used by each laborer has diminished in recent times, while the almost universal rule has been an increase of capital out of proportion to the increase of labor.

There can be but one conclusion drawn from these facts, if they are admitted to be facts; namely, that the opportunities for those who are in a position to supply capital have increased more rapidly than the oppor-

tunities for those who are in a position to supply only their labor. In other words, the progress of invention has caused a shifting in the relative demand for the services of the different classes in the industrial world. The services of the manual laborers, especially of the lower classes where mere muscular strength is an important element in their productiveness, are becoming of less relative importance, but the services of those who supply capital, as well as of engineers and others who supply certain high types of labor, are becoming relatively more important. Stated negatively, one result of this mass of inventions has been that a manual laborer of the lower grades can be spared with less relative loss than formerly, because his work can now be done by machines, while the loss of a given amount of capital, now that we have so many uses for it, would occasion a relatively greater loss than would have been the case if there had been fewer inventions. Under strictly democratic institutions, the world rewards most highly those whom it most needs, or at least those whom it thinks it most needs. One result of invention is to reduce the need, relatively at least, for muscular energy and for every form of mechanical work which can be reduced to routine. Machines can furnish these elements of production; but the use of machines increases the relative need for the services of those who supply capital,—that is, of the capitalists. In somewhat technical language the general result of inventions is to reduce the marginal productivity of the lower grades of labor and to increase that of capital.

The growing demand for capital may possibly, it is true, be supplied by any one who has the foresight to anticipate it. But new capital can only be supplied by waiting, by deferring consumption, by saving something out of present income. This is obviously difficult

to do if one's income is small, and becomes practically impossible when one's income will supply only the necessaries of life, while it becomes relatively easy as one's income increases. Generally speaking, the larger one's income, the easier it is for one to increase one's capital. Therefore, the people who are in the best position to take advantage of the growing demand for capital which results from inventions are those whose incomes are already largest. "To him that hath shall be given."

It may perhaps be argued that even tho the gain from use of machinery seems to go first to the wealthy classes in the form of increased incomes, yet it eventually finds its way to the laborers through the expenditure of these incomes. This is an argument which figures in popular rather than scientific discussion. Probably no writer to whom the term "scientific" could be applied, certainly none of those already cited, would use it, but it plays such a part in pseudo-scientific discussion as to demand notice. In the first place, "it is a poor rule that will not work both ways." If an increase in the incomes of the capitalists works eventually to the advantage of the laborers through the expenditure of those incomes, it would seem also that increased incomes for the laborers would work eventually to the advantage of the capitalists. When the income is spent in purchasing goods, it does not matter who receives and who spends it,—it does not matter whose income it was. It goes to all those who get part of the price of the goods purchased; that is, to both capitalists and laborers. But it is not necessary to bring in any consideration of this kind. The whole matter is very simple, when looked at properly.

Let us assume that the total income from a certain industry is $100 per day, of which the capitalists get $75 and the laborers $25. There is then a total of $100 to be spent for other goods, and this $100 will set labor and

capital to work producing them. But there would be exactly as much expended if the figures were reversed, and the laborers got the $75 and the capitalists the $25. Given a total income from the industry, it makes no essential difference to the rest of society how it is divided between labor and capital. It will do the rest of society exactly as much good if the laborers in this group get the $75 as if the capitalists get it; but it makes a great difference to the laborers themselves in this particular group.

Another argument equally misleading is that, while the general rate of wages has risen, the rate of interest has fallen. As an objection to our conclusion that the capitalist class has gained more than the laboring class as the result of modern improvements, this looks plausible. In reality, however, it has three fatal weaknesses. In the first place, tho the *rate* of interest has fallen, the *gross amount* of interest has risen. The opportunities for the use of capital have so expanded as to make it possible for a considerable portion of the community to live entirely from the income of its capital. Before the régime of machine production, the opportunities for the use of capital were so limited that it was practically impossible for any considerable number to make a living as mere capitalists. It was usually necessary for each would-be capitalist to combine the function of a laborer with that of the capitalist. It was this aspect of the case which led Karl Marx and some of his admirers into the mistaken notion that capital in the modern sense came into existence with the rise of the factory system. Of course, capital existed in the same sense as now, as far back as there were tools; but, so long as there were very few and simple tools, there was no room for any one to own and manipulate sufficient capital to make a living from it alone, without combining also the function of the laborer. But the régime of machine production

has so enormously increased the opportunities for the use of capital that it became possible to separate the function of the capitalist from that of the laborer. In other words, it became possible for certain men to own and manipulate enough capital to enable them to live from its income alone. In this sense, the capitalists, as a distinct class in society, may be said to have come into existence with the rise of the modern factory system, tho capital had existed always. It has also become advantageous to use capital in large aggregates, and this has given a phenomenal growth to the joint-stock principle, and this in turn has stimulated the multiplication of paper evidences of joint ownership. These are sometimes mistakenly called capital, and have even led certain economists astray as to the nature of capital.

The real point is very well illustrated by the example cited by Professor Marshall, of certain money-lenders in London and Paris, who lend small amounts at 10 per cent. per day to costermongers.[1] This rate is enormously high, but the amount which can be loaned is so small that the lenders themselves cannot become opulent. In a more primitive condition the operations of the capitalist resembled these rather than the stupendous operations of the present-day capitalist. Tho the rate of interest was high, the amount of capital which any man could handle and find employment for was so small as to keep the capitalist class from coming into existence as such, or at least to keep it from attaining to any considerable importance. In spite of the fall in the rate of interest, the capitalists as a class are vastly better off under present conditions, and these conditions have been largely brought about by the era of mechanical invention.

The second fallacy in the argument that the fall in the rate of interest indicates that the capitalists have

[1] Principles of Economics, p. 589. 5th edition. London, 1907.

lost rather than gained under modern conditions lies in a misunderstanding of the meaning of a rate of interest. A rate of interest is a deceptive thing. It is, as Böhm-Bawerk has shown, merely a ratio between the valuation of present and future goods. If I possess a given fixed income, say of $1,000, from the ownership of some form of property, the rate of interest will be high or low according as I evaluate the property which is the source of this income. If I and others in my community have so little appreciation of the future, or if we so much prefer present over future goods that we prefer $10,000 now to an income of $1,000 per year through the future, the rate of interest will be high; that is, above 10 per cent. If, on the contrary, the average member of the community prefers the annual income of $1,000 to $20,000 in cash, the rate of interest would be low (that is, below 5 per cent.), tho the income would be precisely the same in both cases. The difference would be that in the one case the value of my property would be estimated at $10,000, and in the second case at $20,000. It would be the same property, would yield the same income, but would yield a lower rate of interest in the latter case merely because it was evaluated more highly.

To be sure, if $10,000 has been the normal valuation of my property, and if it is some form of capital rather than land, presumably $10,000 is what it would cost to reproduce it. In that case a rise in the appreciation of the future would, at first, tend to give this capital a higher present selling value. But this would stimulate the production of other instruments to compete with mine. If the cost of producing them remains at $10,000, so many will be produced and put into operation as to reduce my income to $500. In that case I will have the same capital, and also as much capital, measured in dollars, as before, but my income will be cut in half. That is

to say, if the appreciation of the future should so increase as to make a property yielding an income of $1,000 sell for $20,000 instead of $10,000, it would also make a property yielding $500 sell for $10,000. Since capital is capable of reproduction, my particular form of capital will be duplicated until its annual yield will be only $500, since this, capitalized at the new rate, will give it a selling price high enough to cover its cost of production. In case my income were derived from land, however, which could not be reproduced, the annual yield would remain at $1,000, and the capitalized value of the land would rise to $20,000, and remain there.

Finally, even tho the actual return per unit of capital should have fallen, it would not invalidate our argument. The fall in the return per unit is the result of the enormous increase in the quantity of capital. But the employment of this enormous quantity at any rate of interest would not have been possible, had it not been for the inventions of machinery. Imagine our trying to use enough old-fashioned hand tools to make up an aggregate of capital equal to that which is now in use! Their marginal productivity would probably have been something less than zero.

The argument seems conclusive that the general results of inventions of machinery have been more to the advantage of the capitalist class than of the laboring class, especially if we include only the wage-workers under the latter class.

The justice or the injustice of this result depends upon certain broad questions in social philosophy. It has often been observed that sweeping social changes produce results which are hard to justify. Men of admirable personal qualities, men who were the epitome of all that made men great in the conditions that were passing away, have sometimes been forced to the wall under new con-

ditions. They have failed under the new tests because, in spite of their many excellences when measured by older standards, they were not the kind of men for whom the new time was calling. Many a man, for example, who was well fitted for life in a pioneer community has failed miserably after the pioneer conditions had given place to conditions of settled industry. Possessing physical courage, hardihood, marksmanship, and a knowledge of woodcraft, he has supplied the qualities needed in pioneer life; but, lacking patience, sobriety, foresight, and the capacity for steady work, he has gone to the social scrap-heap when these qualities were absolutely required. We may sympathize with such men and do what we can to ameliorate their condition, but it would be fatal to attempt to modify our social system in such a way as to preserve them from the results of progress. That would be like trying to preserve the use of the wooden plow and the hand loom.

Similarly, the man who only possesses muscular strength and manual dexterity (that is, the man who is only capable of doing what a machine can do), however much we may admire him personally and however useful he may have been in a former state of society, is coming to be less needed. He is no longer "the man of the time." And it would be a disastrous social policy to attempt to shield him against the results of progress. That would be an attempt to preserve a type of man who was no longer needed, at the expense of a type for whom there was a growing need. The growing need is for the man who can invent and also for the man who can initiate the process of machine production. The world will be better off when everything of a purely mechanical and routine nature is done by machinery and when there are no men left who are only capable of doing what machines might very well do. The process of eliminating this type of

man, however, will be a painful process, accompanied by protests and by rebelliousness in spirit, if not in act. The obvious thing to do is to provide the best possible educational facilities, and in the broadest sense, in order that each succeeding generation of young men may have the fullest and freest possible opportunity for evading those occupations which are destined to be taken over by machines and of entering those occupations where the machine helps the man rather than competes with him. If such opportunities can be amply provided, it is to be hoped that the majority of each rising generation will be able to evade the conflict with the machine. But it is also probable that a certain number will not be able, for constitutional reasons, to avail themselves of these opportunities. Such individuals will be doomed to hardship for the simple reason that they will be useless, or almost useless, members of society. Even tho they may possess the most admirable moral dispositions, they will belong to a type of man whom society can very well spare. Neither socialism nor any other scheme would make them other than useless or almost useless members of society. And any scheme, whether labelled "socialism" or by other name, which would preserve these men from the normal results of their relative uselessness by allowing them ample incomes, would be burdening the rest of society for their support, however carefully this bald fact might be hidden under the guise of pseudo-ethical formulæ.

Thus far the discussion has been confined wholly to the influence of machinery upon the laborer's income. We have yet to consider its influence upon the laborer himself. This question merits most careful study and investigation. But up to the present time it has received more attention from popular agitators and moralists than from

professional economists. Among popular agitators it is very frequently assumed that the influence of machinery is to the disadvantage of the laborer's person, aside from its effect upon his wages. It is commonly charged, for example, that the machine tends to dominate the man, that the laborer tends to become a slave of the machine rather than its master.

Just what is meant by becoming the slave of a machine would be difficult to state, and it would become more and more difficult the more one knew about men and machinery. In so far as it means that the conditions of modern machine production are more exacting, in certain ways at least, than more primitive conditions were, it is a mere truism. That is one of the penalties of civilization, and it applies to all classes of society, not to the wage-workers alone. When each one worked independently with detached tools, he was, in a sense, more independent than he can possibly be when he works with a machine which is locked together with a large number of other machines into a system. It is no longer possible for each one to choose his own time for working and resting. He must adjust his working and resting hours to those of the whole group, nor can he work at what speed he chooses. His speed is usually set for him by the machine, and he must adapt himself to it. But this applies in very much the same way to the banker, the merchant, and the manufacturer. They must keep definite office hours, they must travel when trains run and not when they choose, they must take their meals when others do and not when their stomachs prefer, and in a thousand different ways they must conform to the average convenience of the whole social group. While this does require adaptation to a set of circumstances which did not exist under more primitive methods of industry, and while it puts a premium upon certain physical, mental, and moral

qualities which were formerly of less relative importance, it cannot be said to be the result of machinery alone nor to affect the laborers alone. It is a necessary result of a more complex organization of society. Therefore, the charge against the machine as the enslaver of the laborer may be dismissed in so far as it merely means that it makes exacting demands upon him and requires him to conform to the average convenience of the whole group to which he belongs. That is a condition which affects everybody.

But these exacting demands upon conformability do doubtless work some hardship, not only to certain wage-workers, but to others also. A new principle of selection is introduced as a factor in social evolution. The erratic individual, however ingenious or energetic he may be in a spasmodic way, who can only work when the notion strikes him, is of little use in a society which demands steady, constant, patient routine work. And such an individual will seldom prosper. If he is a laborer, he will usually gravitate toward the army of tramps. If he belongs to some other class, he will probably join the army of adventurers who hang about the outskirts of business,—curbstone speculators, small politicians, petti-fogging lawyers, labor agitators, and so forth. All are rejected by the conditions of our interlocking industrial system whose demand is for that kind of efficiency which is coupled with conformability, and the men who possess this kind of efficiency gradually work their way to the front and crowd out their more erratic competitors. As illustrations of this tendency, one need only mention the growing demand for sobriety, not alone in locomotive engineers, but in every class of labor where drunkenness or other forms of unreliability may endanger lives and property, or even work to the inconvenience of the group of workers to which the individual belongs.

In so far as the somewhat impressionistic statement,

that the laborer becomes a slave of the machine, merely expresses an instinctive feeling that the laborers have not benefited as much from machinery as was expected or that they are not served by machinery as much as other classes are, no very fundamental objection can be urged against it. But it is at least open to the objection of being an inaccurate and misleading way of stating the matter. But there can scarcely be any doubt that more is meant than we have yet considered. It is pointed out with a good deal of particularity that the operation of certain machines requires a constant repetition of certain simple movements of arm, wrist, or fingers, day in and day out, and it is argued that such work tends to make the operator a mere automaton, that he becomes merely a part of the machine. But the tendency in all such cases is for these automatic operations to be themselves taken over by the machine as fast as the inventors can bring it about. This relieves the operator more and more of the work of an automaton, leaving him freer to direct and control the machine. Thus the cure for this particular difficulty is found in more machinery rather than in less; that is, in the elaboration and completion of the machine and in the extension of its function rather than in doing away with it altogether.

It is an undoubted fact that the tendency is more and more for these purely mechanical and automatic operations to be taken over by the machines, and it is safe to predict that eventually every kind of work which can be reduced to a mechanical and routine form will be done by machines. This will relieve machinery of the specific charge of reducing the operator to a mere automaton; but, on the other hand, it will make the conditions of life even harder than they now are for those who are constitutionally unfit for any other kind of work. They will then all have to be relegated to the human

scrap-heap instead of being paid the somewhat meagre wages which they now receive.

Looked at broadly, is the average work of a laborer in a machine industry less dignified, less agreeable, less humanizing, than it was before the industry reached the machine stage? From the nature of the question, it is dangerous to dogmatize, because neither the affirmative nor the negative is capable of being demonstrated. The negative view seems to rest mainly upon the assumption that it is more dignified to be occupied with a great many purely mechanical operations than with a very few. The old-fashioned shoemaker, for example, was largely occupied with purely mechanical operations, most of them of a very elementary nature such as a machine can do quite as well as a man. Each of these operations required great concentration of attention, leaving him very little opportunity for other forms of mental activity. He was the slave of each particular task as truly as a modern machine worker can be said to be the slave of his single task. But the old-fashioned shoemaker had to turn from one kind of work to another. This increased the difficulty, and, on the whole, required of him a greater amount of concentration than is now required of the operator of a machine. The latter, who has but one routine task to learn, learns it easily, and can carry it out without very intense concentration of mind. His mind, therefore, would seem to be freer than that of the old hand worker, tho there was more variety to the work of the latter. Whether this greater variety is to his advantage or disadvantage would be difficult to determine offhand. It looks as tho the operator of a machine in a shoe factory, being relieved of the necessity of acquiring several forms of specialized manual dexterity, would be in a better position for free mental activity than the old-fashioned shoemaker.

Perhaps it is not a fair test, but, if any one will look for an old-fashioned shoemaker (and they are still to be found), and watch him at his task, and then go to a shoe factory and watch the various workers at their tasks, and compare the apparent mental alertness of the two types of workers, their interest in their surroundings, their physical and mental buoyancy, their general intelligence, as shown by the uses they make of their leisure hours, he will probably be forced to the conclusion to which the writer has been driven; namely, that the balance is decidedly in favor of the machine. Leaving out, to repeat, the question of earnings, the machine worker appears to have a more agreeable, more dignified, and less dehumanizing (if such an expression is ever appropriate) task than the old-fashioned hand worker. The reason is perhaps, first, that the machine relieves the worker of the most mechanical and least human parts of the work, leaving only the less mechanical and more human parts to be done by men; second, that the mere contemplation of an efficient but intricate machine at work is a source of mental training to any mind which is capable of understanding it. To the man who actually operates the machine and comes gradually to understand the interrelation of all its parts and the adaptation of each part to the work for which it was intended, the operation of the machine becomes positively a means of education. If he has any power of invention, that in turn is stimulated, as shown by the fact that many of our best inventions have come about through the insight of the operators themselves. The man who is not educated by this method is a man who would be the slave of any kind of a task—if a man can ever be the slave of a task.[1]

[1] The writer would not, even if he could, dissipate the dreams of the enthusiast in the arts and crafts movement, which is, in part, a protest against machine production. As the opening up of another field for artistic expression, added to the field of the traditional fine arts, the movement is deserving of the warmest

Our conclusion is, therefore, that, altho the laborer's income has not been increased by the invention of labor-saving machinery of various kinds as much as other incomes have been, the conditions of the laborer have been ameliorated in other ways which help to compensate him for his relative loss. Tho from the standpoint of income he seems to be falling farther behind other classes (even tho he be gaining absolutely), yet his work is growing lighter, more dignified, more human. While he is still far behind the engineer and the business and professional men in this one particular, yet he has gained in this particular rather more than they have through the introduction of machinery. The lawyer's task is very much the same as it always was, tho he is perhaps relieved somewhat by the typewriter and other office paraphernalia. Similarly, with the physician, the teacher, the engineer, the banker, the business man. Tho their tasks are all much more agreeable than that of the laborer, there is not so much difference as there once was, and it is to be hoped that the difference will still further diminish.

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welcome, but as a means of salvation for the laboring classes it seems not only to be futile, but based upon an improper diagnosis of the real conditions. The advocates of this movement are most insistent in asserting the degrading effect of the machine, but they overlook the fact that a machine cannot degrade any one who has intelligence enough and artistic ability enough to profit by the arts and crafts idea. The only man whom this movement can save from the machine is the one who does not need salvation; that is, who would, from his very constitution and nature, be the master rather than the slave of a machine. Moreover, while the machine product may be inferior, artistically at least, to the product of a real artist according to the arts and crafts standard, it is generally very much superior to anything which could be made by hand by any worker who is capable of being dominated by a machine.